

NEW SHARKS AND FISHES FROM WESTERN AUSTRALIA.

PART 4.

By GILBERT P. WHITLEY, F.R.Z.S.
(Contribution from The Australian Museum.)

(Plates xxiv-xxv and text-figs. 1-7.)

Family TRIAKIDAE.

FUR VENTRALIS Whitley, 1943.

(Figs. 1-2.)

Fur ventralis, Whitley, Rec. S. Austr. Mus., vii, 1943, p. 397, and Austr. Zool., x, 1944, p. 259, fig. 5. Bunbury, W.A.

The Whiskery Shark was one of several new species of sharks encountered in Western Australia during investigations for the Division of Fisheries, Council for Scientific and Industrial Research. I measured and opened more than fifty freshly-caught specimens of which males and females were about equally represented. In 1943 and 1944 I saw about one hundred examples of *Fur ventralis* in the Perth Markets, where they comprised between 4% and 5% of the total sharks offered for sale. The departmental returns of the Fisheries Inspectors at Bunbury for the Bunbury and Busselton area specified Whiskery Sharks from 1943 onwards and show that a few examples are caught throughout the summer months, increasing if anything in October and November. *Fur ventralis* comprised 50% of the 1943 Bunbury Sharks caught (92 caught) whilst 187 (9%) were mentioned in the 1944 returns.

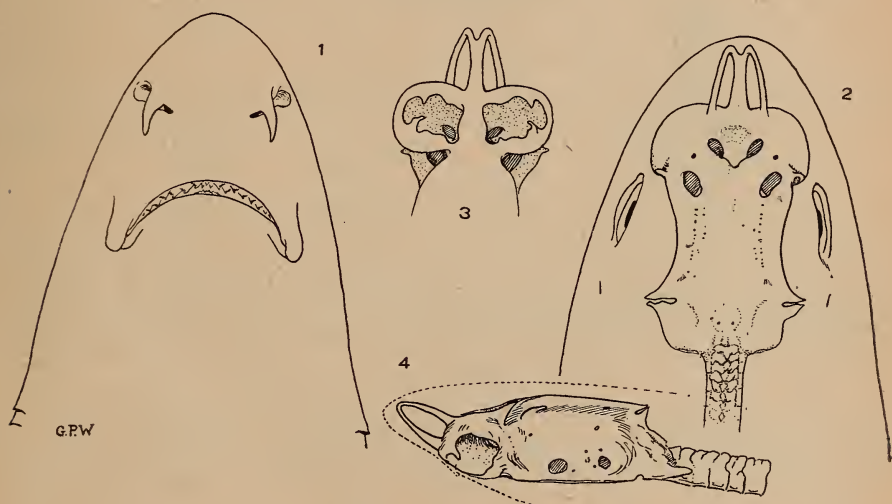


Fig. 1.—Whiskery Shark, *Fur ventralis* Whitley. Head and skull of a 19-lb. female from Two People Bay, Western Australia. No. 1, ventral surface. No. 2, dorsal surface with skull in situ. No. 3, ventral view of anterior portion of skull. No. 4, lateral view of skull.

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Fur ventralis occurs from Arolhos to Esperance, Western Australia, and probably across the Great Australian Bight to South Australia, whence Waite has figured it as *Mustelus*, omitting the "whiskers" (nasal cirrhi) and anal fin.

The Whiskery Shark is caught on rough rock and weedy bottoms on setlines with baits of squid (*Sepioteuthis*) or fish; it also feeds on octopus and an occasional crayfish.

The dental formula varies from 11.1.12 to 15.1.16 over 36 to at least 42.

The head of a Whiskery Shark caught at Two People Bay in September, 1943, is figured here (fig. 1) to show the long nasal barbels and form of labial folds. Its dental formula was 11.1.12 over 36. The dorsal surface of the head, whose slight asymmetry is natural, is shown with the skull in situ. The ventral view of the anterior portion of the skull shows prolongations of the cartilages to support the nasal cirrhi, but generally the cranium resembles the Galeoid sharks.

In filleted specimens in the markets the myocommas show more prominently as darker grey chevrons than those of the Gummy Shark (*Emissola*). Both *Fur* and *Notogaleus* generally have a swerve in the lateral line behind the dorsal and anal fins.

For its size, the Whiskery is a heavy shark, females being generally heavier than males, as shown in Table 1.

TABLE 1.

Total Length in mm.	Length of Claspers in mm.	Weight in Lb.	
		Males.	Females.
905	—	—	6
1,063	—	—	9
1,080	—	—	10 to 11½
1,092	55	10½	—
1,100	—	—	13
1,130	35	9½	—
1,150	64	12 to 14	—
1,180 to 1,200	—	12	13½ to 17
1,230 to 1,240	—	—	16 to 20
1,250 to 1,270	70 to 80	18	16 to 19
1,280 to 1,290	—	16½ to 18	18 to 20
1,300 to 1,310	80 to 90	18 to 21½	19 to 22
1,320	91 to 97	22	—
1,330	85 to 90	23 to 27	—
1,340 to 1,350	83	19 to 22	25
1,400	—	24	—

The proportions, with growth, are fairly constant in both males and females, as shown by a few measurements (Table 2).

TABLE 2.

Total Length in mm.	Head.	Interdorsal Space.	Upper Caudal Lobe.
905	170	210	175
1,063	195	265	200
1,080 to 1,100	200 to 207	270 to 280	190 to 205
1,150	200	290	215
1,193	225	300	210
1,230 to 1,250	232 to 235	280 to 330	220 to 230
1,260 to 1,290	234 to 238	323 to 333	225 to 236
1,300 to 1,330	245 to 253	300 to 355	222 to 250

The liver weighs from 2.7% to 4.5% of the total weight in most specimens, but as females mature it increases to 6.5 to 7.8, and in one mature male (1,250 mm. long) was 10.6%. Maturity in males (judged from length of claspers, differentiation of testes from mesorchium, and presence of sperm in the vesiculae seminales) occurs at about 1,300 mm. total length (claspers 80 or 90 mm.), though one of 1,350 mm. (cl. 80) was immature.

Females in the Albany district were maturing in September-October, 1943. The 1,240 mm. female, 19 lbs. in weight (fig. 1) from Two People Bay, 28 miles from Albany, September 26, 1943, had 6 large eggs up to 37 mm. in diameter in the ovaries, but the uteri were not developed. On January 15, 1944, in the Recherche Archipelago, a 1,180 mm. female, 17 lbs., had large ovarian eggs and 5 eggs, 80 × 30 mm. diameter, in each uterus. Others, 1,195 to 1,340 mm., at the same time were immature. From January 26 to February 3, 1944, in the Recherche Group, we caught:

- (a) Female, 1,315 mm., 22 lbs., with 10 eggs, 70 × 30 mm., in each uterus.
- (b) Female, 1,302 mm., 19 lbs., 6 to 8 eggs in each uterus, as in (a).
- (c) Female, 1,305 mm., 22 lbs. Ovaries with small eggs, uteri undeveloped.
- (d) Female, 1,200 mm., 16 lbs. Immature.

Off Bunbury on January 17, 1945, a 1,240 mm. female of 17 lbs. had 12 eggs, 40 mm. in diameter, but no embryos.

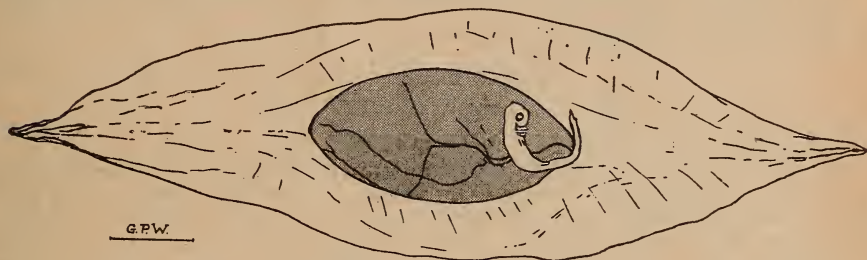


Fig. 2.—Whiskery Shark, *Fur ventralis* Whitley. One of eleven embryos from a 15-lb. female, Bunbury, Western Australia. Membranous envelope 10 inches long. Semi-diagrammatic.

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The first pregnant specimen discovered was a 1,198 mm. (15 lbs.) female caught off Bunbury, March 1, 1945, so that the species evidently first breeds at about 1,200 mm. This had 11 embryos, 30 to 45 mm. long, with external gills and yolk sacs 76 to 95 mm. by 33 to 40 mm. (fig. 2). Each embryo with its yolk occupied a separate, thin-walled compartment, as in *Galeolamna dorsalis*, *G. greyi* and its subspecies, and probably *Emissola antarctica*, but the walls are thin and easily torn or overlooked. In the White-spotted Gummy, *E. ganearum*, the embryos are not separated by compartments within the uterus.

On March 21, 1945, a 1,295 mm. female *Fur* had ova up to 60 mm. in diameter in the ovary, and 9 uterine ova and 9 embryos, 17 to 30 mm. long; uterine yolk sacs 85 × 35 mm. diameter. Unfortunately I had to leave the district before studies on embryonic growth could be made, and the size of full-term embryos is unknown.

STAGES OF A SHARK.

For field purposes the following stages in the development of a Shark (or Ray) may be useful when tabulating data towards life-histories:

- A. Egg.
- B. Embryo. - IV. Primitive streak or undifferentiated to naked eye.
 - III. Recognizable as a shark, external gill-filaments present.
 - II. Recognizable as to genus, absorbing yolk-sac; gills absorbed.
 - I. Full-term embryo, yolk-sac absorbed or nearly so.
- C. Born. 1. Newly born "pup".
 2. Juvenile, umbilical scar still present. Different ones may be born at different sizes and some grow quicker than others.
 3. Growing immature stage. Gonads small or strip-like, ova and testes not differentiated.
 4. Adolescent or virgin. Gonads differentiating from mesovarium or mesorchium; ova small, uterus a mere thin tube.
 5. Adult. Sperm can be expressed from vesiculae of male. Uteri enlarged in females, bearing embryos in season and/or ovaries with large eggs.

The time elapsing from one stage to the next varies considerably in different species of sharks, and many more observations will be necessary before outlines of the life-histories of even the commonest species can be sketched. Readers are asked to record lengths and sexes of all sharks seen, with numbers, sexes and lengths of embryos, with localities and dates, being particularly careful regarding the identification of the species, for which purpose at least the head of the shark should be sent to a museum.

Family SPHYRNIDAE.

SPHYRNA LEWINI (Griffith, 1834).

(Plate xxiv and text-figs. 3-4.)

In my "Fishes of Australia" (1940, p. 120) I mentioned that there seemed to be only one species of Hammerhead Shark in Australasia, but that further study of more specimens was desirable. Though I am still unable to recognize more than one species, the field notes and figures given below, made during investigations for the C.S.I.R., Division of Fisheries, from freshly-caught Queensland and Western Australian specimens, may be of interest to students and can be compared with recent studies on American Hammerheads by Springer (Proc. Calif. Acad. Sci., iii, 1938, pp. 30 and 38, figs. 15-17, *et ibid.*, v, 1940, p. 46, figs. 1-6; Stanford, Ichth. Bull., i, 1940, p. 161, figs. 1-7) and with the account of the skull by Lloyd and Sheppard (Proc. Zool. Soc. Lond., 1922, iv (1923), p. 971, figs. 1-7).

Specimen 1 (Pl. xxiv, fig. 3). Young, immature female, 507 mm. long. Wt. 2½ lbs. Connor's Creek, Fitzroy River estuary, Queensland; March 22, 1943. Head four-lobed in front. Anal origin slightly before that of second dorsal. Lower caudal pit obsolescent. Second and third gill-slits deepest. Small quantity of mud and grit in stomach.

Life-colours: Upper surface pale grey with metallic iridescence, pinkish-bronze. Margins of hammer and ventral surface white. Second dorsal and upper and lower caudal lobes tipped with smoky grey. Lower caudal lobe black-tipped. Eye dirty greyish with pale green tinge. (Biometrics, see Table 4 below.) Side of head at end of hammer, 49.5 mm.

Specimen 2 (Pl. xxiv, fig. 1, and text-fig. 4). Immature female, 1,152 mm. Wt. 13 lbs. Off Bald Head, Albany, Western Australia; September 11, 1943. Austr. Mus. regd. no. IB.1647. Dental formula 14.1.14 over 13.1.13. Teeth each side of symphysis of lower jaw erect, others sloping, not denticulate, notched deeply on outer slopes. Second to fourth gill-slits subequal, 39 mm. Eye to end of hammer, 58.

Thin lateral line visible. No interdorsal ridge. A deep upper and a rudimentary lower caudal pit. Lobes of second dorsal and anal not nearly reaching caudal pits as in Fish. Austr., i, 1940, fig. 128. Origin of first dorsal behind level of inner angle of pectoral, above posterior lobe of latter. Lower caudal lobe acutely rounded. Anal larger than second dorsal and more advanced. Three digested pilchards (*Clupeidae*) in stomach.

Ovaries quiescent; uteri slim and undeveloped. Liver, $\frac{1}{2}$ lb. wt.

Life-colour: Light slate-grey above, white below. Eye bluish-grey. Nictitating membrane milky-white, not brown. Trenchant anterior edges of all fins dusky greyish. Posterior caudal and anal fin margins dusky grey. Creamy yellow margin to front and sides of head. (Biometrics, see Table 4.)

Specimen 3 (text-figs. 3 and 4). Very immature male, 1,506 mm. Wt. 36 lbs. West of Station Island, Recherche Archipelago, Western Australia; January 15, 1944. Claspers, 33 mm. Side of head, 102 mm. Third gill-opening longest. Second dorsal with long posterior lobe. Slate-grey above. Parchment white below. Fins dusky above. Anal and caudal with blackish tip and edges respectively. Eye dark blue with brownish-grey iris. Stomach contained a very digested squid. (Biometrics, see Table 4.)

Specimen 4. Immature male, 770 mm. Wt. 6 lbs. Off Second Beach Point, Esperance, W.A.; January 29, 1944. Claspers, 14 mm. Umbilicus healed. Stomach contained pilchard.

Specimen 5 (Pl. xxiv, figs. 2, 2a-b). Very young female, 600 mm. Same loc. and date. Umbilicus open. W.A. Mus. no. P.2592.

Specimen 6. Very young male, 612 mm. Wt. 1 lb. 13 ozs. Same data.

Specimens 7 to 15. Nine very young specimens, 4 males with 10 mm. claspers, and five females, from between Charley Island and Burton Rock, Esperance, W.A.; February 10, 1944. Umbilical scar in all. (See Table 3.)

TABLE 3.

Length.	Width of Head.	Weight.	Sex.
mm.	mm.	lb. oz.	
560	158	1 8	♂ ♀ ♂ ♀ ♂ ♀ ♂ ♀ ♂ ♀ ♂ ♀
600	162	1 10	
602	160	1 15½	
604	161	2 1	
608	160	1 14	
620	168	2 1	
630	171	2 3	
642	178	2 3	
675	178	2 8	

Liver weight about 3% total weight.

Specimen 16. Immature male, 630 mm. Wt. 2 lbs. Bunbury, Western Australia; January 17, 1945. Width of hammer, 170; claspers, 14; interdorsal space, 154 mm.

Specimen 17. Young male, 712 mm. Wt. 3½ lbs. Bunbury, W.A.; March 2, 1945. Hammer, 195; head and body, 510; upper caudal lobe, 202; interdorsal, 187; clasper, 15 mm.

Specimen 18. Young female, 615 mm. Wt. 2½ lbs. Bunbury, W.A.; March 2, 1945. Hammer, 178; head + body, 480; upper caudal lobe, 195; interdorsal, 183 mm.

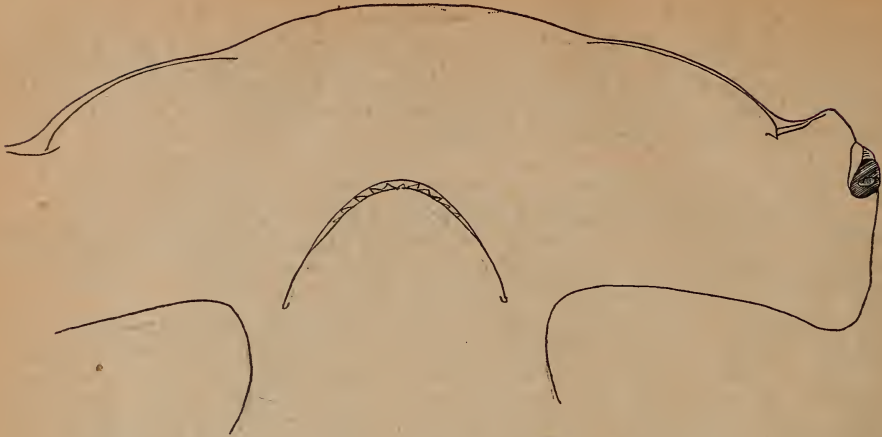


Fig. 3.—Hammerhead Shark, *Sphyrna lewini* (Griffith). Head of male from Station Island, Recherche Archipelago, Western Australia (Specimen no. 3). Width of hammer, $16\frac{3}{4}$ ins.

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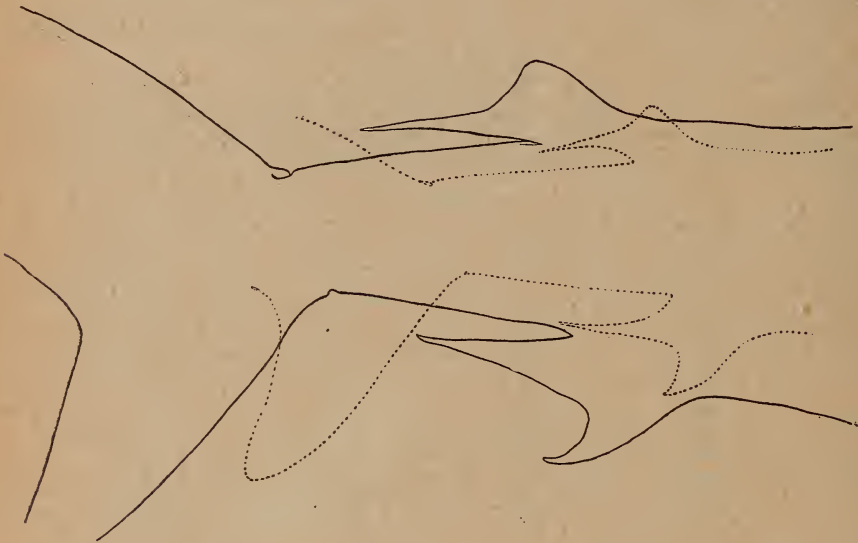


Fig. 4.—Hammerhead Sharks, *Sphyrna lewini* (Griffith). Relationships and proportions of second dorsal, anal and caudal fins in specimens no. 2 (dotted line) and 3 (solid line); about one-third natural size.

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Specimen 19. Male, about 9 ft. long. Wt. about $4\frac{1}{2}$ cwt. Fremantle, W.A.; November 26, 1929. Hammer, about 23 by 7 inches. W.A. Mus. no. P.998.

Messrs. Joyce and Watkins, of Fremantle, W.A., kindly made available their returns from the Shark Fishery of June, 1935, to March, 1936, operating from Fremantle to Rockingham. Seventeen hammerheads were caught, $3\frac{1}{2}$ to $11\frac{3}{4}$ ft.

long. The smallest weighed 17 to 18 lbs., a 4ft. 10 in. specimen weighed 30 lbs. but the others were not recorded. Judging from specimens seen, the reports of Fisheries inspectors and fishermen, and the commercial returns, the Hammerhead Shark is caught off south-western Australia in winter and summer, but mostly in from October to March. Growth after birth is evidently rapid, since specimens nos. 7 to 15 all had umbilical scars, yet no. 4, 770 mm. long, obviously a first-year shark, had the scar healed. The tables below indicate rapid growth in several directions. Data are, however, too scattered and incomplete for any deduction or adumbration of the life-history of this extraordinary Australian shark.

Biometric data for the first three specimens, following my scheme propounded in Proc. Linn. Soc. N.S. Wales, lxviii, 1943, p. 114, are as shown in Table 4.

TABLE 4.

	Specimen.		
	1 Q.	2 Albany, W.A.	3 Recherche, W.A.
H. 1	90	180	240
2	122	247	358
3	76.5	154	214
4	136	289	373
5	118	238	313
6	228	510	694
7	13	22.5	26
8	12.5	18	21
9	137	300	407
10	—	—	—
11	32	24+	104
12	67	227	164
13	37	64	78
14	34	72	99
15	2	Deep notch	c. 1
16	c. 1.5	3	4
17	15	25	38
18	14	24	29
B. 1	351	815	1,054
2	245	544	717
3	155	323	403
4	64	155	211
5	38.5	c. 110	140
6	24	43	62
7	14	37	50
8	Nil	Nil	33
9	"	"	33
F. 1	78	166	229
2	49	109	146
3	24	34	50
4	108	308	400
5	18	40	48
6	18	35	44.5
7	27	54	78
8	37	92	114
9	24	61	78
10	24	49	64
11	19	51	69
12	32	94	112
13	—	—	—
14	62	128	190
15	25	58	78
16	119	288	369
17	26	43	63
18	24	50	74
19	14	30	42.5
20	60	150	192
21	161	344	444
22	58	134	184

Family CLUPEIDAE.

Genus MACRURA van Hasselt, 1823.

MACRURA BLACKBURNI, sp. nov.

D.2, 16; A., 21; P., 16; V., 8; C., 18. Sc., c.36. Tr., 12. Predorsal, c.11. Scutes, 18 + 10.

Head (29 mm.) 3.6, depth (37) nearly 2.9 in standard length (107). Eye (10) 2.9, interorbital (7) 4.1, maxilla (14) 2, and depth of caudal peduncle (13.5) 2.1 in head.

Maxilla reaching below front of eye (or middle in smallest paratype), and denticulated. Upper jaw with slight notch at symphysis. A row of teeth in each jaw, six or more on each mandible; none on palate. Opercles venulose, without grooves. Eyelids broad. Occiput and scapula venulose. About 40 gill-rakers on lower limb of first gill-arch.

Body deep, abdominal profile very convex. Scales with ragged edges and completely crossed by about six grooves.

Origin of dorsal much nearer snout than root of tail. Last two anal rays not enlarged. Pectorals less than head. Ventral origin below middle of dorsal base. Caudal lobes slightly longer than head.

General colour in formalin yellowish, lighter on fins. Three to five dark brown stripes, which may be broken into rows of small marks, along top of sides. Eye bluish. A yellow flange below anterior gill-filaments. Snout, dorsal and caudal fins described as bright yellow in life. Dorsal and caudal lobes conspicuously black-tipped; other fins plain.

Described from the holotype, 107 mm. in standard length, or 5½ inches overall (Austr. Mus. no. IB.2010), the largest of seven specimens.

Locality.—Port Hedland, Western Australia; collected by A. E. Clark in January, 1943 (holotype and 5 paratypes), and by L. G. Smith, 24 October, 1941 (paratype). Nos. IB.2009 to 2115. Mr. Smith also obtained four other specimens which were dissected by Mr. M. Blackburn, who found 41 vertebrae, counting the urostyle.

Variation: D., 18–19; A., 19–21; P., 15–16; Scutes, 17–18 + 10–12. Gill-rakers, 12–18 + 38–40.

Rather like *Clupalosa lippa* (Whitley, 1931) but deeper in body and with strongly marked pattern, different scutes, etc. Differs from *Macrura koningsbergi* (Weber & Beaufort, 1912) in having more predorsal scales and fewer body scales, also in coloration; similarly from *M. maccullochi* (Whitley, 1931) and notable for its toothless palate. The conspicuous black tips to the caudal fin are characteristic of *blackburni*. Similar to *hypselosoma* (Bleeker, 1855) but with larger scales.

Named in honour of Mr. Maurice Blackburn of the C.S.I.R. Division of Fisheries in recognition of his work on the bionomics of Australian Clupeoids. Mr. Blackburn discovered that this species was new but generously placed his specimens and notes at my disposal so that the species could be described for inclusion in my proposed "Fishes of Australia".

Family ENGRAULIDAE.

SCUTENGRAULIS HAMILTONII (Gray, 1830).

A specimen of this anchovy, nearly 4½ inches long, was obtained at Port Hedland in January, 1943, by Mr. A. E. Clark. It has D.i, 14; A., 40; Sc., 44; and Scutes, 17 + 10.

New record for Western Australia.

Family CLUPANODONTIDAE.

FLUVIALOSA PARACOME, sp. nov.

D., 14; A.ii, 19; P., c.14; V.i, 7; C., 17. Sc., 35 to hypural. Tr., 13. Predorsal sc., 13. Scutes 16 + 11 = 27.

Head (30 mm.) 3.2, depth (42) 2.3 in standard length (97). Eye (9) 3.3, snout (5) 6, interorbital (8.5) 3.5 in head. Dorsal filament, 26 mm.

Cleft of mouth obtuse, reaching below front of eye. A symphysial notch. Dentary laterally reflected. No teeth apparent in jaws. Suborbital, upper opercles and humeral region venulose. Interorbital broadly convex. General facies as in the genus.

Body ovate, compressed, covered with cycloid scales with 8 basal striae.

Dorsal origin slightly in advance of level of ventral origin. Distance from ventral to anal origins less than head. Anal rays rather long, not forming pronounced anterior lobe.

General colour in alcohol, silvery-yellowish with the back brown. Eye surrounded with dark blue ring. A smoky-bluish, indistinct bar arises from eye and runs to nape, where it joins its fellow from the other side. Rows of thin lines along junctions of scale rows. No humeral blotch or only faint duskiness. Lobes of dorsal and caudal infuscated.

Described from the holotype, 97 mm. in standard length, L.C.F. 110 mm., or 5 inches in total length. W.A. Mus. regd. no. P.2619.

Locality.—Noonkanbah, Fitzroy River, Western Australia; Mr. W. W. Henwood, 1944. Distinguished from other species by having no humeral blotch, dorsal filament shorter, fewer predorsal and lateral scales, and notable for the depth of the body, height of anal fin, and the head longer than distance between ventral and anal origins.

FLUVIALOSA BULLERI, sp. nov.

D., 14; A., 23; P., c.13; V.i, 7; C., 18. Sc., 39 to hypural. Tr., 16. Predorsal sc., 15. Scutes 17 + 12 = 29.

Head (29 mm.) 4.1, depth (52) 2.3 in standard length (120). Eye (8) 3.6, snout (6) nearly 5, interorbital (8.5) 3.4 in head. Dorsal filament, 34 mm.

Cleft of mouth barely reaching below front of eye, which is not much covered by adipose lids. General characters as in *Fluvialosa* spp.

Body very deep and compressed. Scales without basal radii. Dorsal origin slightly in advance of level of ventral origin. Head notably less than distance from ventral and anal origins. Anal rays forming anterior lobe.

Colour in formalin brownish yellow, darker over back and viscera. Eye dark blue. Vertex dusky but no smoky bar over eye. A thin reddish line from humeral region to middle of caudal peduncle probably overlay a lateral silvery band. A small humeral blotch? Lobes of dorsal and caudal slightly fuscate.

Described from the holotype, 120 mm. in standard length, L.C.F. 127 mm., or nearly 6 inches overall. W.A. Mus. regd. no. P.2945.

Locality.—Ord River, Western Australia; Mr. Ken. Buller, 1945. Distinguished by its small head, very deep body, lobed anal fin, long ventrals, etc.

These two species were listed as A and B in W.A. *Naturalist*, i, 1947, p. 53.

Family PLOTOSIDAE. *

TANDANUS BOSTOCKI Whitley, 1944.

(Plate xxv, fig. 1.)

Tandanus bostocki Whitley, Austr. Zool., x, 1944, p. 260. Serpentine, W.A.

Here figured from the holotype.

Family SYNGNATHIDAE.

Genus CORYTHOICHTHYS Kaup, 1853.

Kaup's original introduction of this generic name was in Wiegmann's *Archiv für Naturgeschichte*, xix, 1, 1853, p. 231, where it was based on five nominal species. Most of the names of these were *nomina nuda*, the only two valid ones being *C. fasciatus* (Gray) and *brevirostris* (Ruppell), and one of these two must be designated genotype. Previous authors have chosen *albirostris* (a *nomen nudum* ex Heckel MS.) or even *conspicillatus* Jenyns (not listed by Kaup) as genotype, but their choices cannot be maintained. If we select *fasciatus* as genotype, *Bhanotichthys* Parr (Bull. Bingham Oceanogr. Coll., iii, 4, July, 1930, pp. 27, 29 and 142) will fall as a synonym of *Corythoichthys*, with the same type. If we pick *brevirostris*, then *Micrognathus* Duncker (Jahrb. Hamb. Wiss. Anstalt, xxix, 1912, p. 235; not *Micrognathus* Kaup, 1853, ex Kuhl and van Hasselt MS., an overlooked *nomen nudum*!) will fall similarly. As *Bhanotichthys* is of more modern introduction (1930) than *Micrognathus* (1912), I now formally designate *Syngnathus fasciatus* Gray, 1830 (*non* Risso) as genotype of *Corythoichthys*, of which *Bhanotichthys* has already been regarded as an indirect synonym by Herald.

Genus HIPPICHTHYS Bleeker, 1849.

Hippichthys Bleeker, Verh. Batav. Genootsch., xxii, 1849, Ichth. Faun. Madura, p. 15. Haplotype, *H. heptagonus* Bleeker (= *Syngnathus carce* Hamilton-Buchanan).

Ichthyocampus Kaup, Arch. Naturg. (Wiegmann), xix, 1, 1853, p. 231; Cat. Lophobr. Fish. Brit. Mus., 1856, p. 29. Logotype, *Syngnathus carce* Hamilton-Buchanan.

Weber and de Beaufort (Fish. Indo-Austr. Archip., iv, 1922, p. 92), with access to a specimen of *heptagonus* Bleeker, included it in the synonymy of *carce*; therefore the generic synonymy given above naturally follows. *Hippichthys* has hitherto been used for "Corythoichthys"-like pipefishes, and for species of *Parasyngnathus*.

Genus PARASYNGNATHUS Duncker, 1915.

Parasyngnathus Duncker, Mitt. Naturh. Zool. Mus. Hamburg, xxxii, 1915, pp. 14 and 79. Orthotype, *Syngnathus argyrostictus* Kaup, 1856, from Java.

PARASYNGNATHUS GAZELLA (Whitley, 1947).

(Fig. 5.)

Hippichthys gazella Whitley, Austr. Zool., xi, 1947, p. 148. Broome, W.A.

D., 28; A., 2; P., c.14; C., 7. Rings 16 + 38. Subdorsal rings 0 + 6.

Head (nearly 11 mm.) longer than dorsal base (7) and more than 7 in total length (79). Eye, 1½ mm.; snout, 5; postorbital, 4.5; depth, 3; caudal, 2.3. Tail, 1½ times head and body.

Supraorbital ridges not continuous with the long, low, wafer-like, entire rostral ridge. Interorbital very concave.

Operculum crossed by a straight keel with radiating striae, not serrated. Above this is a secondary, obliquely ascending ridge. Gill-openings small, superior. Eyes not bulging. Snout somewhat elevated. Three entire nuchal crests.

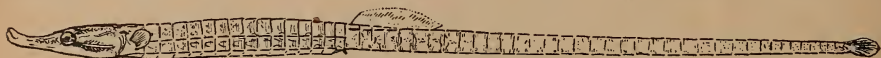


Fig. 5.—Pipefish, *Parasyngnathus gazella* (Whitley). Type from Broome.
G. P. Whitley del.

Body deeper than broad, seven-angled; ventral carina present; tail four-angled. Interstitial scutes present. Dorsal ridges of body ending below posterior dorsal rays, discontinuous with upper tail-ridges, which begin under origin of dorsal fin. Median ridges ending unconnected on last body ring. Lower ridges of trunk and tail continuous (Fig. 8 of Duncker's scheme). No knobs or conspicuous spines. Vent slightly in advance of dorsal origin, well within anterior half of fish. No broodpouch in the type, but probably subcaudal. Dorsal base not elevated, less than head-length.

Colour in preservative, pale brownish with light and darker mottlings and indistinct ocelli. An irregular Y-shaped dark brown mark along head forming a broken band along snout, dividing at eye and branching above and below opercular keels. A notched median brown band along each side of body. No pattern on throat. A small dark mark on each side of ventral surface of head below eye.

Described and figured from the unique holotype, a specimen 79 mm., or 3½ inches, long.

Locality.—Broome, Western Australia; W.A. Mus. regd. no. P.2871.

Mainly distinguished by the ring-formula, 16 + 38, and rather short snout, in which particulars it differs from *Syngnathus argyrostictus* Kaup, 1856, the Javan genotype, and *S. poecilolaemus* Peters, 1869, from South and South-Western Australia. Apart from more tail-rings, the types of eastern Australian *Parasyngnathus altirostris* (Ogilby) have deeper snout, black band along chin and interorbital flatter.

I am indebted to Mr. L. Glauert, Curator of the W.A. Museum, Perth, for the loan of the holotype of *gazella* and for examples of the species described hereunder.

Genus YOZIA Jordan and Snyder, 1901.

Yozia Jordan and Snyder, Proc. U.S. Nat. Mus., xxiv, 1901, pp. 5 and 8. Orthotype, *Y. wakanourae* J. and S. (= *Syngnathus bicoarctatus* Bleeker).

YOZIA BICOARCTATA BREVICAUDA (Castelnau, 1875).

(Fig. 6.)

Syngnathus bicoarctatus Bleeker, Act. Soc. Sci. Indo-Neerl., ii, 1857, p. 99. Amboina (*vide* Weber and Beaufort, 1911).

Syngnathus zanzibarensis Gunther, Fishes of Zanzibar (Playfair), 1866, p. 140, pl. xx, fig. 5. Zanzibar.

Syngnathus brevicaudus Castelnau, Res. Fish. Austr., 1875, p. 48. Swan River, W. Australia.

Ichthyocampus maculatus Alleyne and Macleay, Proc. Linn. Soc. N.S. Wales, i, March, 1877, p. 353, pl. xvii, fig. 2. Darnley I., Torres Strait, Queensland. Type in Macleay Museum, Sydney.

Yozia wakanourae Jordan and Snyder, Proc. U.S. Nat. Mus., xxiv, 1901, p. 8. Wakanoura, Japan.

Syngnathus coarctatus Jordan and Snyder, *loc. cit.*, p. 8. Error for *S. bicoarctatus* Bleeker.

Yozia brevicaudis Duncker, Jahrb. Hamburg Wiss. Anst., xxxii, 1915, p. 109.

Yozia bicoarctata Duncker, *op. cit.*, p. 107. *Id.* Weber and Beaufort, Fish. Indo-Austr. Archip., iv, 1922, p. 101, fig. 42.

Yozia bicoarctata erythraeensis Dollfus and Petit, Bull. Mus. Nat. Hist. Nat. (Paris), (2) x, 1938, p. 500. Golfe de Suez.

Yozia bicoarctata melanesiae Fowler, Proc. Acad. Nat. Sci. Philad., 97, 1945, p. 61, figs. 3-4. Saipan.

Two specimens, which I identify as this subspecies, have been kindly lent by Mr. Glauert, who collected one of them at Cottesloe (W.A. Mus. regd. no. P.1231), a beachworn specimen, with fins eaten away, which had probably floated down from the tropics. The other example (no. P.964) was from Hanover Bay in the Kimberleys, presented by Mr. Deutschmann. The latter specimen is larger and more complete and is described below with notes on the differences between the two when such occur.

D., 26; A., 4; P., left 16, right 17. Caudal rudimentary in P.964 (double with 12 rays and little more than eye in length in P.1231). Rings 23 + 46 (or 20 + 39 in P.1231). Subdorsal 3 + 2.

Head (30 mm.) 12.9, depth at dorsal origin (8) 48.5 in total length (c. 388). Snout, 16 mm.; eye, 4; postorbital, 10; interorbital, nearly 4.

Head longer than dorsal base. Axis of head at an obtuse angle to that of body. Surface of head and body with fine rugae which form vertical striae on parts of lateral scutes. Snout as broad as deep. Forehead ascending from snout at an obtuse angle. Orbits apparently not prominent. Interorbital flat across sunken area between orbital bevels. No rostral crest, merely a short, slight ridge anteriorly. Head about 13 to 19 in total length, about $2\frac{1}{2}$ to $3\frac{1}{2}$ in trunk. Operculum without keel but with radiating pits and pimples sometimes forming streaks or reticulations and rough-surfaced. A prenuchal and two nuchal shields, without ridges. Gill-openings crescentic, close together, near back. Form very elongate. Trunk swollen in middle in P.964, but not in P.1231. Body six-angled, without ventral carina, slightly deeper than broad, not dilated. Tail four-angled, wider than deep, at least anteriorly. Interstitial scutella well developed. Body-ridges weak, without spines. Superior ridges of trunk converging towards end of dorsal base, discontinuous with superior ridges of tail, which end supero-laterally

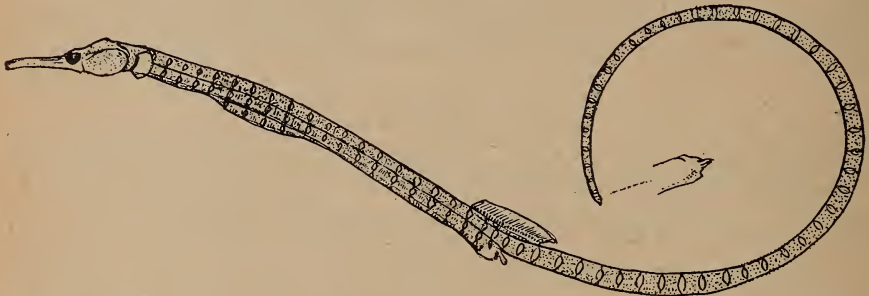


Fig. 6.—Pipefish, *YoZIA bicarctata brevicauda* (Castelnau). Specimen with reduced caudal fin from Hanover Bay.

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on second subdorsal ring. Median ridge of trunk descending below dorsal fin to join inferior ridge of tail, which is discontinuous with inferior ridge of trunk (similar to no. 5 of Duncker's scheme). No broodpouch in my specimens, though this would probably be abdominal. Soft area before vent swollen and bulbous in P.964 with few scutella anteriorly; normal in P.1231. Vent well before middle of length.

Base of dorsal fin elevated. Caudal fin present, though missing through injury or rudimentary in P.964, but in P.1231 there appear to be two caudal fins side by side with a total of 12 rays. It seems likely that the tail of this species may be bitten by other fishes and possibly regenerated after injury, which may explain the variety in number of tail-rings.